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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/660,570	09/12/2003	Peter Hemingway	1509-109A	5307

22879 7590 09/20/2005

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EXAMINER	
CHEN, WENPENG	
ART UNIT	**PAPER NUMBER**
2624	

DATE MAILED: 09/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/660,570	HEMINGWAY, PETER
	Examiner	Art Unit
	Wenpeng Chen	2624

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 June 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3 and 6-27* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3 and 6-23* is/are rejected.

7)☒ Claim(s) *24-27* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *30 June 2005* is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Examiner's responses to Applicant's remark

1. Applicant's amendments and responses filed on 6/30/2005 overcome the followings set forth in paper #20050328 mailed on 3/28/2005:

-- objection to drawings (paragraph 1);

-- objection to specification (paragraphs 2-3);

-- objection to Claim 23 (paragraph 4);

-- rejection to Claim 23 under 35 U.S.C. 101 (paragraph 10).

2. Applicant's arguments filed on 6/30/2005 have been fully considered but they are not persuasive. The Examiner has thoroughly reviewed Applicants' arguments but firmly believes that the cited references to reasonably and properly meet the claimed limitations.

a. Applicant's argument -- The Applicant alleged that Sakamoto does not teach the feature of "establishing a value for a given lattice point by *using* the values of only m of (n+l) known value lattice points defining an n simplex touching or enclosing the given lattice point, wherein m is a positive integer equal to the number of n-simplexes of none-zero volume whose vertices consist of the given lattice point and n of the (n+1) known value lattice points, and by returning a weighted average of the m of the known value lattice points." In page 19 of the response, the Applicant indicated that they cannot understand how Sakamoto's teaching meets the requirement related to weight averages.

Examiner's response -- An explanation is provided below.

The passages from column 2, line 14 to column 3, line 47 explain that a color space is specified with fine lattices, for example with 200 steps in each of three dimensions. They also explain that the color space is specified by has coarse lattice too, for example with 16 steps in each of three dimension for interpolation operation. The vertices correspond to the known lattice points of the present application. The point specified by (x, y, z) is a point of the fine lattice and corresponds to the given lattice point of the present application.

Let us consider a case where the color space is defined by a fine lattice, each dimension having 2^8 (256) steps and by a coarse lattice having 2^4 (16) steps. For a given lattice of (x,y,z), it is expressed as $(x_i+x_f, y_i+y_f, z_i+z_f)$ in Sakamoto. To demonstrate how Sakamoto teaches the above limitation, let us take some examples of interpolating points where the points (1) are in a tetrahedron in a cube having a vertex at wherein $x_i = 1000$, $y_i=1000$, and $z_i=1000$ in binary format and (2) have the following relationship $x_f \geq y_f \geq z_f$. According to Table 2, the first row of Table 2 shall be selected for the equation to interpolate values of these points. According to Table 2, one only needs at most four (4) values for the interpolation process: U(1000, 1000,1000), U(1001, 1000,1000), U(1001, 1001,1000), U(1001, 1001,1001). As taught in Sakamoto, the equation is shown in column 10, with U(A) = U(1000, 1000, 1000), U(B) = U(1001, 1000, 1000), U(C) = U(1001, 1001, 1000), U(D) = U(1001, 1001, 1001).

To explicitly show Sakamoto's teaching, the Examiner considered interpolating the following given lattice points as examples:

point a: (1000.1110, 1000.0110, 1000.0010) with (x_f, y_f, z_f) = (0.1110, 0.0110, 0.0010);

point b: (1000.1110, 1000.0010, 1000.0010); with (x_f, y_f, z_f) = (0.1110, 0.0010, 0.0010);

point c: (1000.0010, 1000.0010, 1000.0010); with (x_f, y_f, z_f) = (0.0010, 0.0010, 0.0010);

point d: (1000.0000, 1000.0000, 1000.0000); with (x_f, y_f, z_f) = (0.0000, 0.0000, 0.0000).

How the interpolated values of these points are derived is listed below.

-- For point a, the interpolated value is given by U(P) = U(A) (1-xf) + U(B) $(x_f - y_f)$ + U(C) $(y_f - z_f)$ + U(D) z_f, because $x_f > y_f > z_f > 0$. Point a is inside the tetrahedron.

-- For point b, the interpolated value is given by U(P) = U(A) (1-xf) + U(B) $(x_f - y_f)$ + U(D) z_f, because $y_f = z_f$. Point b is on the plane defined by points A, B, and D.

-- For point c, the interpolated value is given by U(P) = U(A) (1-xf) + U(D) z_f, because $x_f = y_f = z_f$. point c is on the line connecting point A and point D.

For point d, the interpolated value is given by U(P) = U(A) (1), because $x_f = y_f = z_f = 0$. Point d is at point A.

As shown above, values of only three (3) of four (4) known lattice points are used for interpolation for point b. For point c, values of only two (2) of four (4) known lattice points are used for interpolation. Evidently, Sakamoto does teach the feature of "establishing a value for a given lattice point by *using* the values of only m of (n+l) known value lattice points defining an n simplex touching or enclosing the given lattice point, wherein m is a positive integer equal to the number of n-simplexes of none-zero volume whose vertices consist of the given lattice point and n of the (n+1) known value lattice points, and by returning a weighted average of the m of the known value lattice points."

b. Applicants' argument -- Applicant can find no basis in Sakamoto for the position paragraph (a) on page 6 of the Office Action. Applicant does not concede that column 10, lines

6-24, of Sakamoto inherently teaches the equation set forth in Applicant's claim 6 and respectfully requests the Examiner to provide some rationale for this assertion.

Examiner's response -- The relationship between ratio of volume and (x_f, y_f, z_f) for generating weights for interpolation equation associated with Fig. 8 is shown in equation III in column 9 of Sakamoto. For a tetrahedron shown in Fig. 10, the relationship is also applied. For example, it is well known in field of geometry that the volume of tetrahedron is 1/3 x (area of a base) x height of a vertex above the base. The volume of tetrahedron ABCD of Fig. 10 is thus 1/3 x (area of ABC face) x height (that is 1). The volume of tetrahedron ABCP of Fig. 10 is thus 1/3 x (area of ABC face) x height (that is z_f). Therefore, the weight for U(D), z_f, is the same as the ratio of volume of tetrahedron ABCP to volume of tetrahedron ABCD. This is also true for the weights used for U(A), U(B), and U(C), because they are all government the same geometric rule.

c. Applicants' argument -- Applicant is unable to completely understand the statement in the Office Action that the embodiment of Miyake for determining and selecting 4, and 2 vertices when a to-be-interpolated point is inside a tetrahedron, on a face of tetrahedron, and on a line the tetrahedron, respectively.

Examiner's response -- As explained in the previous Office Action, Sakamoto teaches the feature of "establishing a value for a given lattice point by ***using*** the values of only m of (n+l) known value lattice points ..." as discussed above. The Examiner highlighted the term "using" to point out it is different from the term "determining", because the Examiner cannot conclude that "***using*** the values of only m of (n+l) known value lattice points" will inherently requires

"determining the values of only m of (n+l) known value lattice points." For example, for interpolating point b as discussed above, the interpolated value is given by U(P) = U(A) (1-xf) + U(B) $(x_f - y_f)$ + U(C) x 0 + U(D) z_f, because $y_f = z_f$. It is obviously that the equation can be carried out in two ways: (1) to determine all U(A), U(B), U(C), and U(D) , then multiplying each with their weight, including U(C) x 0 or (2) to evaluate the weights first, then decide not to determine U(C) because it will be multiplied by zero.

To remedy this lack of explicitly approach for calculating the equation, the Examiner relies on Miyake's teaching for determining values for interpolation on a need basis. For example, if two values are needed, only these two values are determined. As pointed out by the Examiner, it is obvious to one of ordinary skill in the art, at the time of the invention that this approach can speed up color interpolation process. Miyake teaches getting only those needed values for further process. For the example given above for point b interpolation, only three values are used for Interpolation, one of ordinary skill in the art will apply Miyake's teaching to determine only three values U(A), U(B), and U(D) of taught by Sakamoto.

d. Applicant's argument -- Applicant cannot agree that Sakamoto discloses the claim 15 step, because a jump table is a computational structure not found Sakamoto.

Examiner's response -- Sakamoto indeed teaches the feature related to a jump table. Table 2 is a structure for providing weights values of vertices A-H and thus providing a jump table for selecting weighting parameters for equations. There are two sets of inputs to Table 2: (1) (x_f, y_f, z_f) for the discrimination conditions and (2) the positions on the top for selecting corresponding weights.

Applicants are reminded that the Examiner is entitled to give the broadest reasonable interpretation to the language of the claims. So the Examiner considers Table 2 to be Applicant's jump table within the broad meaning of the term as explained above. The Examiner is not limited to Applicants' definition which is not specifically set forth in the claims. In re Tanaka et al., 193 USPQ 139, (CCPA) 1977.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-3, 6-11, and 14-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakamoto et al. (US patent 4,275,413 cited in IDS) in view of Miyake (US patent 6,415,065.)

Sakamoto teaches a method of determining a value for a function, comprising:

-- establishing an n-dimensional lattice having a plurality of lattice points, the function having values at the lattice points, wherein n is a positive integer greater than or equal to two; (column 2, lines 14-32; column 4, lines 13-43; column 12, lines 15-34; column 9, line 50 to column 10, line 5; In the example, there are 256 x 256 x 256 lattice point. It has that n=3.)

- wherein n=3 and the n-simplex comprises a tetrahedron; (n=3 for RGB; Figs. 9-10)

-- recording values for a subset of the lattice points, the lattice points of the subset being known value lattice points; (Figs. 9-10; column 9, line 50 to column 10, line 24; Points A, B, C, and D are known value lattice points.)

- (a) wherein the known value lattice points form a sparse lattice with known value lattice points separated from each other by an integer multiple of the distance between adjacent lattice points, (b) wherein said integer multiple is an integer power of two, and (c) wherein the integer is 4 and all given lattice points coincide with a value lattice point or lie between two adjacent value lattice points or lie within a triangle described by three adjacent value lattice points; (column 12, lines 15-56; The integer multiple is 16 for the example.)

-- establishing a value for a given lattice point by *using* the values of only m of (n+l) known value lattice points defining an n simplex touching or enclosing the given lattice point, wherein m is a positive integer equal to the number of n-simplexes of none-zero volume whose vertices consist of the given lattice point and n of the (n+1) known value lattice points, and by returning a weighted average of the m of the known value lattice points; (column 9, line 50 to column 10, line 24; The value U(P) is interpolated from 4 points for the 3-dimensional lattice. *The cited passage, for example, teaches that "a weighted average of three of the four known value lattice point values is used if the given lattice point is on a face of the tetrahedron bounded by the three of the four known value lattice points but is not touched by an edge of the tetrahedron" as explained below. In this case, m=3, (n+1) =4, and there are m (=3) 3-simplexes of none-zero volume. Only values associated with none-zero volume are used. For example, when z_f=0, the point is at a face, U(O) is not used in Eq. III because it is multiplied by zero.*)

- wherein a weighted average of all four known value lattice point values is used if the given lattice point is enclosed by the tetrahedron but is not touched by a face of the tetrahedron, a weighted average of three of the four known value lattice point values is used if the given lattice point is on a face of the tetrahedron bounded by the three of the four known value lattice points but is not touched by an edge of the tetrahedron, a weighted average of two of the four known value lattice point values is used if the given lattice point is on an edge of the tetrahedron bounded by the two of the four known value lattice points but is not at a vertex of the tetrahedron, and wherein a value of one of the known value lattice points is used if the given lattice point is also the known value lattice point; (column 9, lines 1-33; column 10, lines 6-24; As shown in column 2, lines 43-46, x_f, y_f, and z_f, are the decimal parts. When $z_f = 0$, the P point lies a surface defined by $z=z_i$, the equation at column 10 shows that only points A, B, and C are used. When $z_f = 0$ and $y_f = 0$, the P point lies on a line defined by $z=z_i$ and $y=y_i$, the equation at column 10 shows that only points A and B are used. When $z_f = 0$, $y_f = 0$ and $x_f = 0$, the P point is at the point defined by $z=z_i$, $y=y_i$ and $x=x_i$, the equation at column 10 shows that only point A is used.)

-- (a) wherein if the given lattice point is enclosed by the tetrahedron but is not touched by a face of the tetrahedron, and the tetrahedron has vertices of known value lattice points with positions A, B, C, D and values a, b, c, d at the respective vertices, and wherein the given lattice point has position P and wherein the volume between four positions is expressed as Vol (position 1 position 2 position 3 position 4) the value p returned is given by: p = (Vol(A-BCP) . d + Vol(ABDP) c + Vol(ACDP) b + Vol(BCDP). a) / Vol(ABCD), (b) wherein if the given lattice point is on a face of the tetrahedron bounded by the three of the four known value lattice points

but is not touched by an edge of the tetrahedron, the three of the four known value lattice points being A, B and C with values a, b and c respectively, the value p returned is given by p = ((Area(BCP) . a) + (Area(ACP) . b) + (Area(AEP) . c)/Area(ABC), and (c) wherein if the given lattice point is on an edge of the tetrahedron bounded by the two of the four known value lattice points but is not at a vertex of the tetrahedron, the two of the four known lattice points being A and B with values a and b, the value p returned is given by p = ((Distance (AP) . b) + (Distance (BP) . a))/Distance(AB); (column 9, lines 1-33; column 10, lines 6-24; The passage in column 9, lines 1-33 clearly shows the interpolation is based on volumes. When the interpolation based on those recited in Claims 6-8 of the present application are carried out, they result the same equation given in column 10, lines 6-24 of Sakamoto patent. Therefore, Sakamoto inherently teaches the features.)

-- wherein the step of establishing a value comprises determining a set of four known value lattice points which form a tetrahedron touching or enclosing the given lattice point, and providing the weighted average from the positions of four known value lattice points, the known values of one or more of the four known value lattice points, and the position of the given lattice point; (column 9, line 50 to column 10, line 24; column 12, line 15 to column 13, line 55)

- wherein the step of providing the weighted average comprises using the positions as inputs to a jump table. (column 10, line 19-24 and Table 2; The weights as shown in Table 2 depend on the position of the point P. *The Examiner considers that the cited Table 2 is a jump table because Table 2 uses the results of discrimination conditions listed in column 1 to determine the factors to be used for interpolation of a given lattice in one of possible*

tetrahedrons. The result given column 1 provides a pointer for an assigned equation associated with the factors. Therefore, it meets the broad definition of a jump table.)

However, Sakamoto does not teach explicitly "***determining*** the values of only m of (n+l) known value lattice points defining an n simplex touching or enclosing the given lattice point." As cited above, Sakamoto teaches using the values of only m of (n+l) known value lattice points but not explicitly teaches that only m values of (n+l) known value lattice points are determined during the process.

Miyake teaches a method of determining a value for a function, comprising:

-- ***determining*** the values of only m of (n+l) known value lattice points defining an n simplex touching or enclosing the given lattice point for tetrahedron interpolation; (column 12, line 43 to column 13, line 31; For example, the method teaches the feature of determining and selecting 4, 3, and 2 vertices when a to-be-interpolated point is inside the tetrahedron, on a face of the tetrahedron, and on a line of the tetrahedron, respectively.)

It is desirable to speed up color transformation. It would have been obvious to one of ordinary skill in the art, at the time of the invention, to apply Miyake's teaching to modify Sakamoto's interpolation process for not determining those values associated with known value lattice points that are not used in Sakamoto's interpolation process, because this speeds up the interpolation computation. The combination thus teaches "establishing a value for a given lattice point by determining the values of only m of (n+l) known value lattice points defining an n simplex touching or enclosing the given lattice point, wherein m is a positive integer equal to the number of n-simplexes of none-zero volume whose vertices consist of the given lattice point and

n of the (n+1) known value lattice points, and by returning a weighted average of the m of the known value lattice points."

The above-cited method is applied for mapping values in a first color space to values in a second color space. (column 2, lines 3-13) Therefore, the combination also teaches Claim 16.

Sakamoto further teaches an apparatus to implement the above-cited method. The apparatus performs many computation steps and therefore is a computer. Because Claims 17-19 are the corresponding apparatus claims of the method Claims 1, 2, and 3, respectively, the combination also teaches Claims 17-19.

5. Claims 20-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Sakamoto and Miyake as applied to Claims 1-3, and further in view of Schoolcraft et al. (US patent 6,466,333 cited in IDS.)

Claims 20-22 are the corresponding medium claims of the method Claims 1-3, respectively. As discussed above, the combination of Sakamoto and Miyake teaches all the steps recited in Claims 20-22. However, the combination does not explicitly teach the medium recited in Claims 20-22.

Schoolcraft teaches a computer program product comprising a computer readable medium and a computer program. (Column 4, lines 12-16 and 40-49)

It is desirable to make a processing method portable from a computer to another computer. It would have been obvious to one of ordinary skill in the art, at the time of the invention, to store the processing steps of the method taught by the combination of Sakamoto

and Miyake in a computer readable medium taught by Schoolcraft, because the overall combination makes the processing method portable and therefore increase its application.

6. Claims 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Sakamoto and Miyake as applied to Claim 10, and further in view of Yip et al. (US patent 6,289,138 cited in IDS.)

The combination of Sakamoto and Miyake teaches the parental Claim 10. However, the combination does not teach the feature associated with the limitation that the integer is 8 or more.

Yip teaches a color interpolation process wherein in 12 bits are assigned to each color component. The 12 bits are divided into 4 bit in an interval table and 8 bits for fractional table. (column 50, lines 38-53)

It is desirable to be able to perform color mapping for high-resolution color having 12 bits for each color component as well as regular resolution color having 8 bits because it broadens the application of the color mapping process. It would have been obvious to one of ordinary skill in the art, at the time of the invention, to combine the teachings of the combination of Sakamoto and Miyake and Yip to interpolate Yip's color data of 12-bit format, because the overall combination broadens the application of the color mapping method. The overall combination teaches that wherein the integer is 8 and all given lattice points coincide with a value lattice point or lie between two adjacent value lattice points or lie within a triangle described by three adjacent value lattice points or lie within or lie within a tetrahedron of four adjacent value lattice points.

Allowable Subject Matter

7. Claims 24-27 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

a. The following is a statement of reasons for the indication of allowable subject matter. The prior art fails to teach the method of Claim 24, the computer of Claim 25, and the medium of Claim 26, which specifically comprise the following features in combination with other recited limitations:

-- establishing a value for a given lattice point by *determining* ***the values of only m of (n+l) known value lattice points*** *defining an n simplex* touching or enclosing the given lattice point, wherein m is a positive integer equal to the number of n-simplexes of none-zero volume whose vertices consist of the given lattice point and n of the (n+1) known value lattice points, and by returning a weighted average of the m of the known value lattice points

-- *wherein the (n+1) known lattice points enclose the given lattice point such* ***that the given lattice point is not coincident with any of the known value lattice points, the known value lattice points do not define an n-simplex touching the given lattice point,*** *and* ***the given lattice point not on a diagonal between any known value lattice points of the n-simplex***.

b. The following is a statement of reasons for the indication of allowable subject matter. The prior art fails to teach the method of Claim 27 which specifically comprises the following features in combination with other recited limitations:

-- listing interpolation equations that are applicable for particular case associated with the n-dimensional lattice;

-- *responding digital values representing the m known value lattice points such that high order bits of the digital values provide table offset that determines which coarse lattice is to be used and low order bits of the digital values choose which case to execute, wherein each case corresponds to an intermediate point between the m known value lattice points*;

-- causing each chosen case to access the values for the specific coarse lattice points required by the interpolation equations for that case.

Conclusion

8. THIS ACTION IS MADE FINAL. See MPEP § 706.07(a). The Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for response to this final action is set to expire THREE MONTHS from the date of this action. In the event a first response is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR

1.136(a) will be calculated from the mailing date of the advisory action. In no event will the statutory period for response expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wenpeng Chen whose telephone number is 571-272-7431. The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David K Moore can be reached on 571-272-7437. The fax phone numbers for the organization where this application or proceeding is assigned are 571-273-8300 for regular communications and 571-273-8300 for After Final communications. TC 2600's customer service number is 571-272-2600.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 571-272-2600.

Wenpeng Chen
Examiner
Art Unit 2624

September 16, 2005